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PRACTICAL HYDRAULICS.

The Control of Water as Applied to Irrigation, Power and Town Water Supply Purposes. By P. A. M. Parker. Pp. vii + 1055. (London: G. Routledge & Sons, Ltd., 1913.) Price 21*s.* net.

THIS comprehensive and authoritative work contains a wealth of matter relating to practical hydraulics which one might seek in vain for in any other published book on the subject. In the preface the author tells us that the book is the product of actual engineering experience, and is mainly based on a collection of notes and formulæ accumulated in some eighteen years of professional work, during the major portion of which he was engaged in independent practice, and that therefore it must be regarded not as a text-book, but rather as a manual for engineers in active work. He also remarks that, "although the initial knowledge assumed in the reader may be considered to be somewhat unusual, many portions of the book have stood the test of everyday office requirements in the hands of draughtsmen and assistants." And it is only fair to say that an examination of the work is entirely favourable to the author on these points, although, of course, in a work covering such a wide field, here and there are matters of a controversial character, which might be dealt with if the exigencies of space permitted.

The book contains the following chapters, namely: i., preliminary data; ii., general theory of hydraulics; iii., gauging of streams and rivers; iv., gauging by weirs; v., discharge of orifices; vi., collection of water and flood discharge; vii., dams and reservoirs; viii., pipes; ix., open channels; x., filtration and purification of water; xi., problems connected with town water supply; xii., irrigation; xiii., movable dams; xiv., hydraulic machinery other than turbines; xv., turbines and centrifugal pumps; xvi., concrete, ironwork, and allied hydraulic construction; (*a*) tables; (*b*) graphic diagrams. But these headings scarcely give an adequate idea of the scope of the book, as some of the chapters are divided into important sections. For instance, in chapter xiv. we have: section A, enlargements and contractions in pipes; section B, water hammer; section C, ejectors and syphons; section D, air lift and hydraulic compressor; section E, hydraulic ram; section F, resistance to motion of solid bodies in water; section G, impact of water on moving bodies. All of these are important subdivisions, and they appear to be handled in an entirely satisfactory and convincing way; but having regard to the title of the chapter, one looks in vain for any discussions on the piston-pump and Humphrey's pumps, the most important of all hydraulic machines. However, the hydraulic engineer has other books available in which these machines are fully dealt with, and the author was wise in confining himself to matters that do not so completely come within the province of the mechanical engineer.

Chapter vii., dams and reservoirs, is one of the best in the book; the 130 pages devoted to this important section will be appreciated by both designers and engineering students. A valuable feature of the work is that each chapter is prefaced by a list of its own symbols and a sequential table of an extremely useful character, and many of the chapters have also a summary of the equations and formulæ. The mathematics used in this lucid and most readable work are fairly easy, certainly to those accustomed to read works on hydraulics.

Another exceedingly valuable feature is the bibliography, as the book teems with references to original authorities; indeed, it is a standing testimonial to the author's patient and untiring labours. He is to be congratulated upon producing a work that will in all probability rank as high in connection with applied hydralics as Bellasis's work on hydraulics does in connection with theoretical questions; in fact, Mr. Parker's encyclopædic work is the most notable book of the kind that has appeared for many years, and it will probably become a classic.

H. J. S.

SPHERICAL ASTRONOMY.

Lehrbuch der sphärischen Astronomie. By Dr. L. de Ball. Pp. xv + 387. (Leipzig: W. Engelmann, 1912.) Price 20 marks.

DR. L. DE BALL'S excellent treatise shows abundant evidence of a long and careful preparation. From the nature of the subject striking innovations are not to be expected; it is rather in the minute details of the exposition that the merit of the present work is found. In some places the mathematical treatment has been simplified, in others the discussion has been made more rigorous and thorough. The author's long experience as a practical astronomer has led to improvements in all parts of the subject, little in themselves, but when taken together making a notable advance. According to the introduction, the book is intended to be both a text-book for students and a work of reference; it is in the latter respect that we commend it. Spherical astronomy is a rather heterogeneous collection of but distantly related problems, and a minute treatment of isolated questions, many of which are only required in special researches and have no general

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interest, makes a very unsuitable course of reading for the student. But for those who are seeking specially full information on any of the subjects dealt with, this work will prove a very useful aid.

The introductory chapters deal very concisely with interpolation formulæ, the chief developments in series, and the method of least squares (without any account of the error-function). A long chapter deals with the theory of the earth's rotation. This part is rather hard reading, owing to the great number of symbols introduced. It would, we think, have been worth while to set out the definition of each symbol on a separate line, in order that it might be more readily referred to; for the reader can scarcely carry in his head the meaning of all the symbols, and their definitions are scattered through a great many pages of the text. Another long chapter deals with refraction, and includes a discussion of the effect of water-vapour on the constant of refraction. The treatment of the great problems of fundamental astronomy, the determination of the equinox, the obliquity of the ecliptic, and the construction of a fundamental catalogue is most thorough and satisfactory. In the chapter on parallax it may be noted that the correction to the ellipticity of the earth is included as an unknown in the determination of the moon's parallax; this small illustration shows the author's practical acquaintance with his subject, for the two quantities are so closely related that it is not improbable that the best determination of the figure of the earth may ultimately be obtained from lunar observations.

We would strongly criticise the absence of all reference to the theory of photographic observations. Thus, whilst the effect of precession, parallax, aberration, and refraction on micrometer measures is fully discussed, the formulæ relating to their effect on photographic measures are ignored. The theory of the projection of the celestial sphere on a photographic plate is eminently a branch of spherical astronomy, and at the present day it is most constantly required by practical astronomers, yet the text-books persist in devoting their whole attention to the obsolescent position angle and distance, instead of to rectangular coordinates. Such an omission is misleading to the student, and it is a defect in a work of reference for the observatory. Much of geometrical astronomy consists in a perfunctory application of three formulæ of spherical trigonometry; but the theory of rectangular coordinates is a more difficult subject, and the observer could not generally work out for himself the necessary formulæ without guidance.

A. S. E.

RECENT BOTANICAL PUBLICATIONS.

(1) *An Introduction to Plant Geography.* By Dr. M. E. Hardy. Pp. 192 + 66 figures. (Oxford: Clarendon Press, 1913.) Price 2*s*. 6*d*.

(2) *The Living Plant: A Description and Interpretation of Its Functions and Structure.* By Prof. W. F. Ganong. Pp. xii + 478 + 178 figures. (London: Constable and Co., Ltd.; New York: Henry Holt and Co., 1913.) Price 15*s*. net.

(3) *Flowerless Plants: How and Where they Grow.* By S. Leonard Bastin. Pp. xi + 152 + 64 plates. (London Cassell and Co., Ltd., 1913.) Price 6*s*. net.

(4) *School and Home Gardens.* By W. H. D. Meier. Pp. iv + 319 + 159 figures. (Boston and London: Ginn and Co., n.d.) Price 4*s*.

(5) *Agronomy: A Course in Practical Gardening for High Schools.* By W. N. Clute. Pp. xvi + 296 + 195 figures. (Boston and London. Ginn and Co., n.d.) Price 4*s*. 6*d*.

(6) *Das botanische Praktikum.* Fünfte Auflage. By the late Dr. E. Strasburger and Dr. M. Koernicke. Pp. xxvi + 860 + 246 figures. (Jena: Gustav Fischer, 1913.) Price 24 marks.

(7) *Paläobotanisches Praktikum.* By Prof. H. Potonié and Dr. W. Gothan. Pp. viii + 152 + 14 figures. (Berlin: Gebrüder Borntraeger, 1913.) Price 4 marks.

(8) *Die palaeobotanische Literatur.* By W. J. Jongmans. Dritter Band: Die Erscheinungen der Jahre 1910 und 1911 und Nachträge für 1909. Pp. 569. (Jena: Gustav Fischer, 1913.) Price 26 marks.

(9) *Icones of the Plants of Formosa, and Materials for a Flora of the Island, based on a Study of the Collections of the Botanical Survey of the Government of Formosa.* By B. Hayata. Fasc. ii. Pp. 156 + 40 plates. (Taihoku: Bureau of Productive Industries, 1912.)

(1) THE compiler of this introduction to plant geography appears to be somewhat out of touch with the modern development of the subject from the ecological point of view. The work is apparently intended for school use, but one would have thought that the best method of approach would be to deal at some length with the conditions of plant life in general, instead of devoting to this subject only twenty pages towards the end of the book as the author has done, and to lay stress on the idea of plant communities rather than to plunge, after a brief glance at a few types of British vegetation, into the descriptions of the "main vegetations of the globe," which form the greater part of the book. However, these descriptions, though extremely condensed, are thoroughly readable and vivid, but it is very doubtful whether the author's method of

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